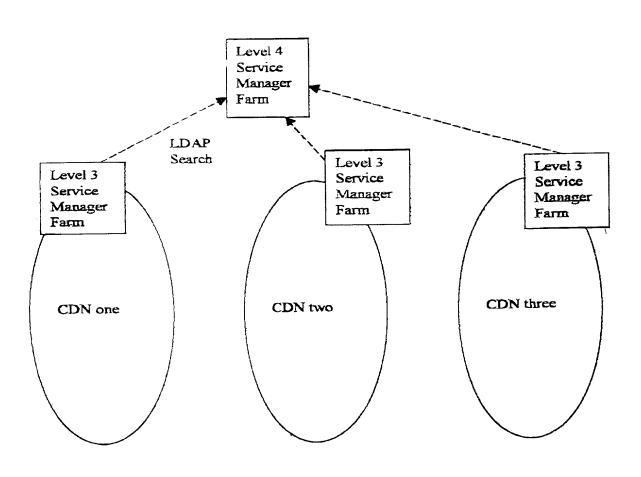
Fig 1 Content Peering for Multiple CDN Networks



Although it depends on directory information forwarding policy, typically Level 4 Service Manager stores the content location information of CDN one, CDN two and CDN three.

Level 3 Service Manager of CDN one stores only the content location information of CDN one.

Level 3 Service Manager of CDN two stores only the content location information of CDN two.

Level 3 Service Manager of CDN three stores only the content location information of CDN three.

Content **Provider** DNS DNS refer Origin Server DNS Server IPSEC Server Farm Service Manager Level 3 Service Manager Farm LDAP Level 2 Level 2 Level 2 Search Sérvice Service Service Manager Manager Manager Farm Farm Farm Data Center Data Center Data Center three one two **IPSEC** tunnel

Fig 2a Integrated Service Network of Multiple Data Centers

Although it depends on directory information forwarding policy, typically Level 3 Service Manager stores the content location information of Data Center one, Data Center two and Data Center three.

Level 2 Service Manager of Data Center one stores only the content location information of Data Center one.

Level 2 Service Manager of Data Center two stores only the content location information of Data Center two.

Level 2 Service Manager of Data Center three stores only the content location information of Data Center three.

Data going across Data Center can go through IPSEC tunnel to guarantee privacy and security or even form a VPN among Data Centers.

**DNS** refer **DNS** DNS Server Content Level 3 Origin Server Farm **Provider** Service Manager TPSEC Server Farm Service Manager LDAP Search Data Center Data Center three one Level 2 Data Center Service two Manager Farm LDAP Level 1 Level I & LDAP Service Service Manager Level 1 Manager Service Manager LDAP HTTP Server 1 TPSEC **HTTP Server 2** IPSEC Caching Proxy Server 1 LAN Nerwork Streaming Server 1 IPSEC Caching Proxy Server 2 Streaming Server 2 LAN IPSEC Server 1 Integrated **TPSEC Server 2** Service Switch Integrated LAN Service Switch Integrated Service Switch

Fig 2b Integrated Service Network of Multiple Data Centers

Fig 3 Service Manager and Caching Proxy Server Farm in a Data Center

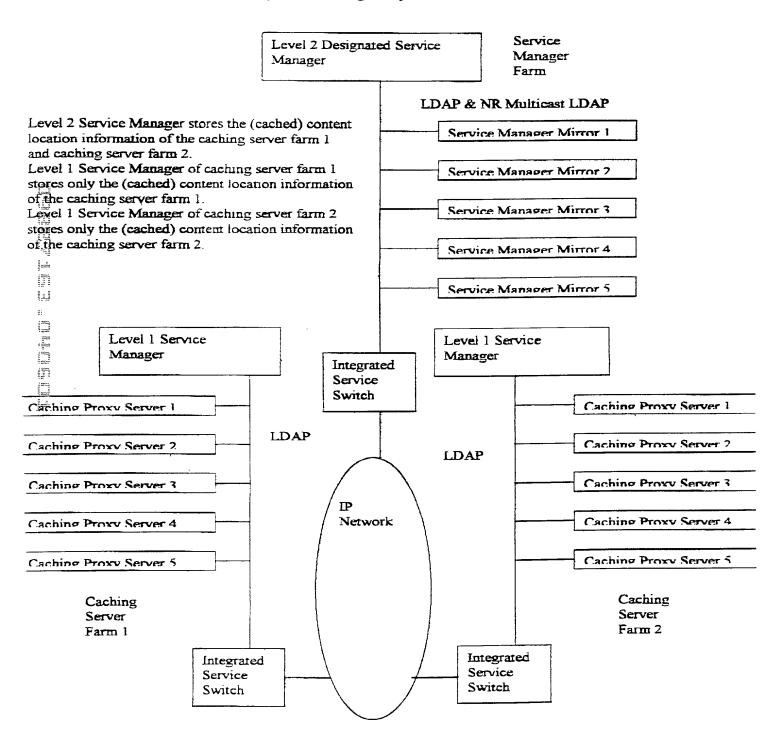
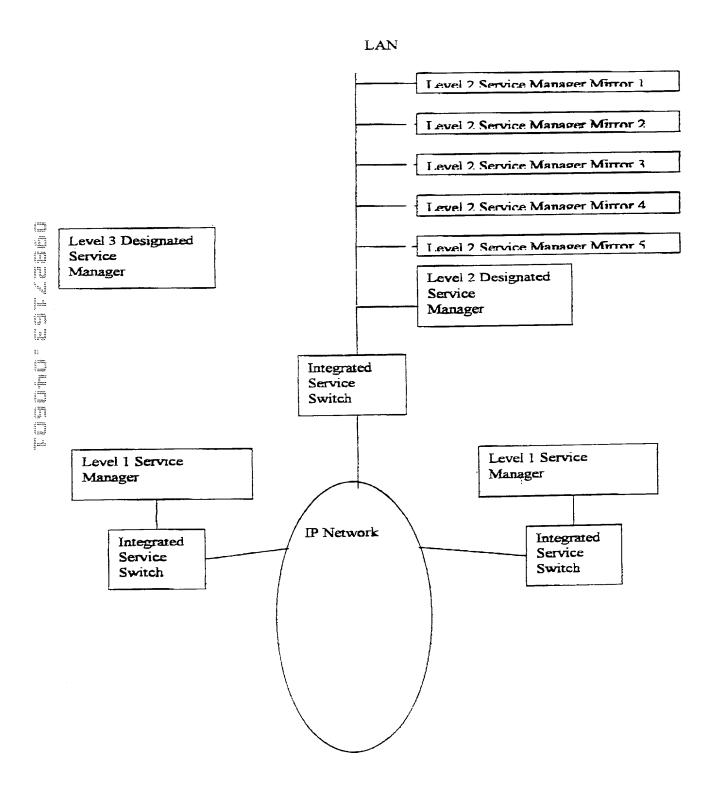


Fig 4 Directory Information Multicast Update in Service Manager Farm



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Fig 5 Reliable Multicast Transport Protocol Sequence

SM: Service Manager SE: Service Engine

Transport Transport Recipient Sender Transport multicast syn (seq n, init, more) Transport acknowledge (seq n, init, more, SE1) Transport acknowledge (seq n, init, more, SE2) (Wait a while to see any re-send request by any SE) (If no re-send request, then acknowledge by SM) (If it does have re-send request or missing acknowledge by any SE, then SM won't acknowledge and sender will resend the syn packet Transport acknowledge (seq n, init, more, window i, SM) Transport multicast update (seq n+1) Transport multicast update (seq n+i) (Wait a while to see any re-send request by any SE) (If no re-send request, then acknowledge by SM) (If it does have re-send request, then sender resends the packets in the current window) - re-send request) Transport acknowledge (seq n+i, window j) Transport multicast update (seq n+i+1) Transport multicast update (seq n+i+2) Transport multicast update (seq n+i+k, last) Transport acknowledge (seq n+i+k, last by SE1) Transport acknowledge (seq n+i+k, last by SE2) Transport acknowledge (seq n+i+k, last by SM)

Fig 5 Integrated Service LAN SE: Service Engine

ISS: Integrated Service Switch SM: Service Manager (Level 1)

BSM: Backup Service Manager (Level 1)

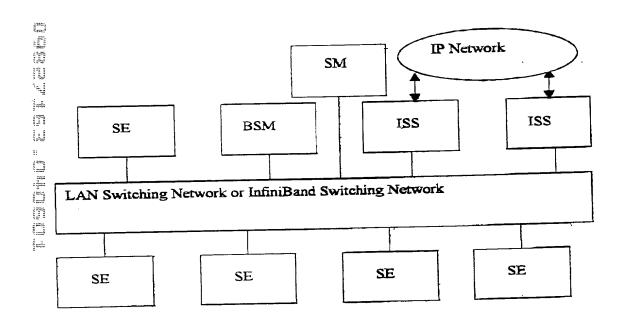
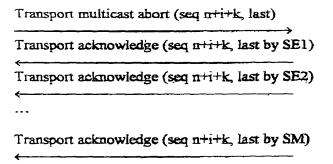


Fig 6 Transport multicast abort operation sequence



This abort operation allow sender to abort the multicast transport operation for whatever reason, it can send a Transport multicast abort message and should acknowledge by all others and SM. SM will acknowledge until all others have acknowledged.

Fig 7 Reliable Multicast Directory Update Protocol Sequence

Directory Information Sender Directory Information Recipient

LDAP\_MULTICAST\_OP is one of the following operations:

LDAP\_ADD,

LDAP\_DELETE,

LDAP\_MODIFY\_ADD,

LDAP\_MODIFY\_REPLACE,

LDAP\_MODIFY\_DELETE

LDAP\_OP multicast (seq n, init, more)

...

LDAP\_OP multicast (seq n+i, last)

Fig 8 Rehable Multicast Management Protocol Sequence

SNMP Manager SNMP Agent

SNMP\_MULTICAST\_OP is one of the following operations:

SNMP\_GET,

SNMP\_GETNEXT,

SNMP\_SET

SNMP\_MULTICAST\_OP multicast (seq n, init, no more)